

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended) A method of forming a ~~transferring die~~ surface onto a producing die to produce an optical element, wherein the ~~transferring die~~ surface transfers an optical surface onto the produced optical element, the method comprising the steps of:

bringing a cutting tool to come in contact with a material so as to cut ~~cutting a the~~ material; and

moving the material relatively to the cutting tool so as to form the ~~transferring die~~ surface with a curvature on the material;

wherein the material has a hardness larger ~~not smaller~~ than Rockwell hardness HRA 80 or Vickers hardness Hv 1000 and the cutting step is conducted to cut the ~~material~~ with a ~~critical~~ cutting-in depth of 5 ~~1~~ μm or less ~~for the material~~, and

wherein the cutting tool has a cutting edge capable of coming in contact with the material and the cutting step is conducted while the cutting tool is set such that a single point of the cutting edge comes in contact with the material.

2. (Withdrawn) The method of claim 1, wherein in the cutting step that a cutting edge of the cutting tool and the material are relatively brought in contact with each other at a cutting point, the cutting step is conducted while the cutting point of the cutting edge is continuously shifted along the cutting edge of the cutting tool.

3-4. Cancelled.

5. (Currently Amended) The method of claim 1, wherein the transferring optical surface is an aspherical surface.

6. (Currently Amended) The method of claim 1, wherein the transferring die surface has an effective diameter of 5 mm or less.

7. (Original) The method of claim 1, wherein the cutting edge of the cutting tool comprises a diamond.

8. (Currently Amended) The method of claim 7, wherein ~~the transferring surface~~ of the material is shifted relatively to the cutting edge of the cutting tool comprising the diamond in a direction predetermined on a basis of a crystal orientation of the diamond.

9. (Currently Amended) The method of claim 8, wherein the cutting edge of the cutting tool comprises a rake face facing forward in a cutting direction and a flank facing backward in the cutting direction for the transferring surface to be cut, and wherein a (110) surface of the diamond is used as the rake face ~~and the cutting step is conducted while the transferring surface is shifted relatively to the rake face along another (110)-surface of the diamond extended in a direction intersecting with the rake face.~~

10. Cancelled.

11. (Withdrawn) The method of claim 8, wherein the cutting edge of the cutting tool comprises a rake face facing forward in a cutting direction and a flank facing backward in the cutting direction for the transferring surface to be cut, and wherein a (110) surface of the diamond is used as the rake face and the cutting step is conducted while the transferring surface is shifted relatively to the rake face along a (100) surface of the diamond extended in a direction intersecting with the rake face.

12. (Withdrawn) The method of claim 8, wherein the cutting edge of the cutting tool comprises a rake face facing forward in a cutting direction and a flank facing backward in the cutting direction for the transferring surface to be cut, and wherein a (110) surface of the diamond is used as the rake face and the cutting step is conducted while the transferring surface is shifted relatively to the rake face with an angle within a range of ± 15 degrees for a (100) surface of the diamond extended in a direction intersecting with the rake face.

13. (Withdrawn) The method of claim 8, wherein the cutting edge of the cutting tool comprises a rake face facing forward in a cutting direction and a flank facing backward in the cutting direction for the transferring surface to be cut, and wherein the cutting step is conducted while the transferring surface is shifted relatively to the rake face along a (111) surface of the diamond.

14. (Withdrawn) The method of claim 8, wherein the cutting edge of the cutting tool comprises a rake face facing forward in a cutting direction and a flank facing backward in the cutting direction for the transferring surface to be cut, and wherein the cutting step is conducted while the transferring surface is shifted relatively to the rake face with an angle within a range of ± 15 degrees for a (111) surface of the diamond.

15. (Currently Amended) The method of claim 8 9, wherein the rake face of the cutting edge has a rake angle within a range of ± 15 degrees from a normal line perpendicular to the surface of material to be cut.

16. (Currently Amended) The method of claim 8, wherein the ~~transferring surface~~ material is relatively rotated to the cutting edge of the cutting tool ~~on a plane including the cutting point and~~ around the optical axis of the optical surface to be formed.

17. Cancelled.

18. (Currently Amended) The method of claim 8, wherein the cutting step is conducted with a hyper precision processing machine having a control resolving power of 100 nm or less for a shaft to hold one of the cutting tool and the transferring die surface so that the position of the shaft is controlled within an error of 100 nm or less.

19. (Currently Amended) The method of claim 18, wherein the hyper precision processing machine has a moving section ~~has~~ movable along 3-axes or more.

20. (Withdrawn) The method of claim 18, further comprising:
measuring the shape of the transferring surface formed by the cutting step;
obtaining deviations between the measure shape and an ideal shape; and
cutting again the transferring surface on the basis of the obtained deviations
while shifting the transferring surface relatively to the cutting tool.

21. (Withdrawn) The method of claim 20, further comprising:
obtaining an error component of each item of the polynomial of Zernike on the
basis of the deviations; and
judging the quality of the shape of the transferring surface by comparing the error
component with a predetermined value.

22. (Withdrawn) The method of claim 20, wherein the producing die having the
transferring surface is mounted on a rotating shaft of a processing machine to conduct
the cutting step, and the measuring step is conducted without dismounting the
producing die from the rotating shaft.

23. (Original) The method of claim 1, wherein the producing die is a producing
die to form an optical element from a plastic material and the transferring surface
transfers an optical surface onto the optical element.

24. (Original) The method of claim 1, wherein the producing die is a producing die to form an optical element from a glass material and the transferring surface transfers an optical surface onto the optical element.

25. Cancelled.

26. (Currently Amended) The method of claim 1, wherein at least the material of the ~~transferring~~ die surface of the producing die to be cut is a ceramic.

27. (Original) The method of claim 26, wherein the ceramic is a silicon carbide.

28. (Original) The method of claim 27, wherein the ceramic is a silicon carbide formed by chemical vapor deposition (CVD).

29. (Withdrawn) The method of claim 1, further comprising:
polishing the transferring surface after the cutting step.

30. (Withdrawn) A processing apparatus used for the method of claim 1.

31. (Withdrawn) An optical element producing die formed by the method of claim 1.